2 Subject-Oriented Business Processes Meet Strategic Management: Two Case Studies from the Manufacturing Industry

Matthias Lederer, Peter Schott and Matthias Kurz

Abstract

Successful companies use business processes for the transfer of long-term strategies in operational workflows. The modeling approach presented in this chapter shows how strategic objectives of a company can be combined with the S-BPM modeling notation. The new modeling approach is used in two case studies. First, redesign rules for the strategic optimization of workflow models are demonstrated in the case of the customer support processes of an international enterprise. A second case study introduces a company-wide monitoring system through the example of the product development process of a multinational company from Germany.

M. Lederer (✉) · P. Schott
Information Systems (Services-Processes-Intelligence), University of Erlangen-Nuremberg, Lange Gasse 20, 90403 Nuremberg, Germany
e-mail: matthias.lederer@fau.de

P. Schott
e-mail: peter.schott@fau.de

M. Kurz
QUA-LiS NRW, Paradieser Weg 64, 59494 Soest, Germany
e-mail: Matthias.kurz@qua-lis.nrw.de

A. Fleischmann et al. (eds.), *S-BPM in the Wild*,
DOI 10.1007/978-3-319-17542-3_2

2.1 Motivation

"How beautiful the strategy, you should occasionally look at the results".[1]

This statement suggests that strategies need an adequate implementation and measurable results in order to become alive. Successful companies know how to operationalize sustainable strategies, which means to translate long-term goals into daily business (Wolf and Harmon 2012). Business processes are a core way for organizations to operationalize strategic objectives in workflows (Mintzberg 1994). However, studies show that process managers are struggling with making this critical transfer (Minonne and Turner 2012; Sidorova and Isik 2010).

The two companies serving as case studies in this chapter were confronted with this problem in two different stages of the BPM lifecycle. The first manufacturing company needed an approach to *redesign customer support processes strategically*. In the second case, a control system was needed that allows checking *whether innovation strategies were implemented in product development processes* modeled in S-BPM. These two situations are typical challenges of companies because strategic objectives (e.g., increasing customer satisfaction, minimization of time to market, etc.) are often not systematically taken into account during typical BPM activities (Hörschgen 2001). There are two basic aspects for incorporating strategy in business processes (Petzmann et al. 2007):

- First, strategic guidelines need to be incorporated in the *process models*. This implies that process models need to be designed so that they can implement strategic objectives when they are executed. If, for example, the strategic goal in the first case study is to increase customer satisfaction by fast issue handling, the S-BPM model should include elements (e.g., activities or documents) which are suitable to achieve this goal (e.g., forwarding scenarios and role models if a decision maker is not working fast enough).
- Second, once the models are aligned, the achievements of strategic objectives need to be managed in everyday business. That means monitoring and controlling *process instances*. This way, process owners can check if workflows follow the strategy. In the second example, a suitable control system should answer the question of whether development projects are forcing the strategic objective of increasing technology push innovations.

In this context and as well as in the two scenarios, the S-BPM approach focuses on one of the most essential factors for strategy implementation (Outram 2014): humans. Studies show that the consideration of human factors such as communication and understanding (Mair 2002), compliant leadership (Weber and Schäffer 2000) as well as motivation (Richardson 2004) for strategic long-term issues are

[1]Winston Churchill, British politician (1874–1965).

essential for the uptake and implementation of strategic objectives. In customer support processes, requests are processed better the more accurately employees understand the objectives behind the procedures.

The modeling approach by Lederer et al. (2014a, b) shows how strategies and S-BPM models can be integrated in a communicable diagram. This *Strategy Process Matrix* is used in this chapter as a basis (Sect. 2.2). Two approaches were developed in real-case scenarios to increase the degree of strategy orientation both in S-BPM models (Sect. 2.3) as well as in *process instances* (Sect. 2.4).

In a nutshell, this contribution complements the well-known and comprehensive approaches, methods, and IT applications which exist for S-BPM by integrating principles of strategic management in the subject-orientated thinking.

2.2 Strategy-Oriented Business Process Modeling[2]

The strategy-oriented business process modeling (SOBPM) approach provides both a method and a notation for linking process models with strategy. The approach combines strategic targets (*strategy*) with the workflow of a *business process*. The resulting *Strategy Process Matrix* realizes the essential basis for the case studies.

2.2.1 Strategy Map

The Balanced Scorecard (BSc) is a widely used (Chen and Jones 2009) standard tool in business practice (Chavan 2009). It groups an organization's strategic objectives in four perspectives. A Strategy Map (Quezada et al. 2009) depicts these objectives along with their dependencies using causal chains (Kaplan and Norton 1996). While the four perspectives of the BSc ensure a holistic view on the objectives (Quezada et al. 2009), the Strategy Map assists in interpreting the dependencies between objectives.

Section 2.3 shows how to combine Strategy Maps and S-BPM business process models using the Strategy Process Matrix. In the SOBPM approach, this combination requires two adjustments. First, the customer perspective of the BSc is generalized into the *stakeholder perspective*. That way, objectives can be assigned to all internal and external stakeholders of a business process (e.g., internal customers as well as external organizations). Second, entries in the Strategy Map need to be modeled on *unique vertical levels*. This means that each row of the Strategy Map contains only one objective.

[2]Substantial parts of the modeling approach documentation are taken from Lederer et al. (2014a, b).

2.2.2 Business Process Model

There are numerous possibilities for the formal as well as semi-formal representation of business processes. The SOBPM approach was originally developed by using BPMN but case studies and applications (e.g., see Sects. 2.3 and 2.4) show that both Subject Behavior (SBD) and Subject Interaction Diagrams (SID) can be used for visualizing business process in the SOBPM approach. In any case, regardless of the chosen process notation, one adjustment is necessary: To later ensure an easy-to-understand layout of the Strategy Process Matrix, each *flow object* contributing to one or more strategic objectives needs to be designed horizontally on a unique level in the model. This means that no flow node may be placed below another flow node. Flow objects are understood as nodes which have the potential to execute a strategy (e.g., activities, messages, tasks). If there are parallel sequence flows with relevant nodes, one of the flow nodes must be moved to the right.

2.2.3 Strategy Process Matrix

The graphical connection between strategic objectives and the process flow creates the *Strategy Process Matrix* (see Fig. 2.1): The matrix combines each objective of the Strategy Map (lines) with flow objects of the process flow (rows).

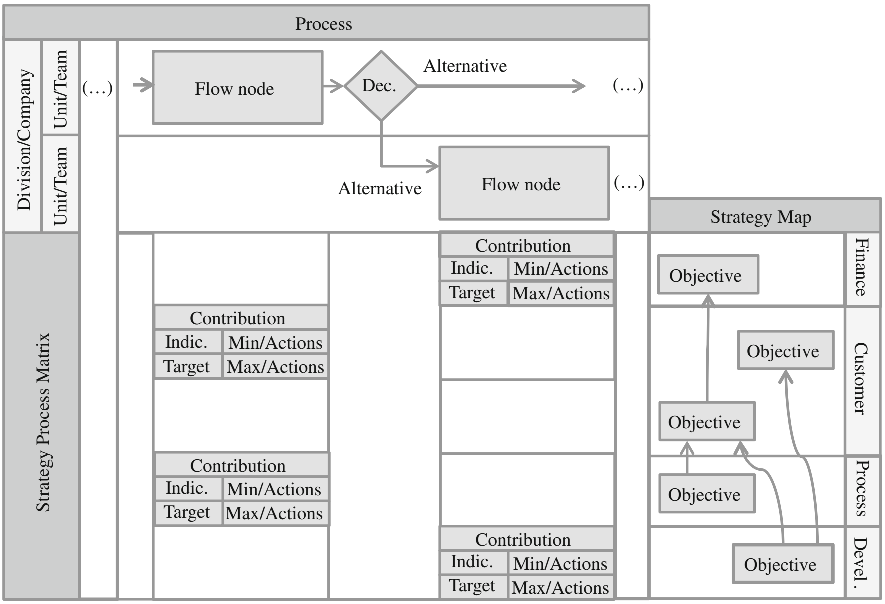

Fig. 2.1 Structure of the matrix (Lederer et al. 2015)

The Strategy Process Matrix essentially is a table. This table's columns are defined by the flow objects of the process model. Correspondingly, the table's rows are the strategic objectives of the Strategy Map. Each flow object (perhaps enriched by modeling elements like databases or documents if BPMN is used) may be assigned to one or more objectives. If multiple flow objects support the achievement of an objective, several fields of the matrix may contain information in the same row. Within each matrix field, the following four pieces of information should be documented: (1) *Contribution* (How does a flow object support strategy achievement?), (2) *indicator* (Which event, status or quantitative performance indicator can measure the contribution?), (3) *target* (What is the target value for the indicator and what deviations are acceptable?), (4) *min/max action* (What actions should be taken if the indicator cannot meet the target value?).

In the case of *Subject Behavior Diagrams* (SBD), function states of the process model are assigned to a unique horizontal place, because they contribute to the achievements of strategic targets. Since transitions present only the change of states and sending as well as receiving states are not able to execute strategic intentions of an organization, they are not modeled in unique columns. Figure 2.2 shows the illustrative and modified excerpt of a Strategy Process Matrix using an SBD from a case study from the automotive industry: The process of transferring recorded data to internal (e.g., legal department) and external (e.g., suppliers and other partners) stakeholders strives for increasing profitability which includes improved stakeholder relations. Moreover, the process has to follow external regulations, such as compliance standards which require a highly skilled process team. Also, the business process needs to increase the quality of data. The process workflow describes a data request from an external partner sent to an internal clerk from the data management team. This skilled worker receives the data request and decides,

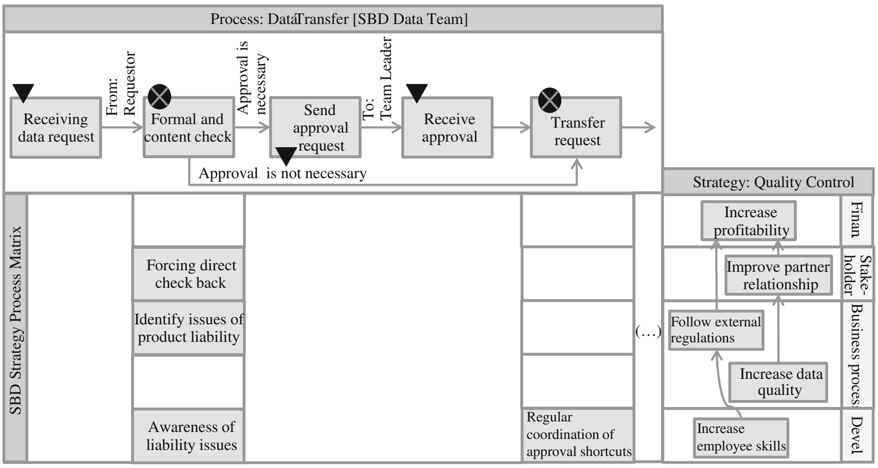

Fig. 2.2 Extract of a subject behavior matrix (Lederer et al. 2015)

based on a content check, if an approval by the team lead is necessary or if the data can directly be transferred to the external requestor.

In the Strategy Process Matrix, it becomes evident that many functions make contributions to the achievement of strategic objectives. For example, the activities of the formal examination and the granting of permits to make a special contribution to the operationalization of the strategic objectives, and in particular, to the compliance with external laws and internal process standards.

With the SBD diagram, representing process steps from the actor's point of view, contributions can be identified based on subjects. In strategic optimization projects, oftentimes, not all actors need to be examined in detail. Instead of examining or explaining the entire process, the contributions of one single subject can be used to show strategy-relevant actions. Furthermore, limiting the matrix to the SBD of a single subject yields a smaller matrix with fewer entries.

In the *Subject Interaction Diagram* (SID), each message needs to be arranged on a unique horizontal level. Since both case studies in this contribution are using the SBD-based matrix, the modeling approach using SID will not be explained. The interested reader may refer to (Lederer et al. 2014a, b), where the SID-based Strategy Process Matrix is outlined.

2.3 Case Study on Strategic Improvement of S-BPM Models

By now, the Strategy Process Matrix has been tested in different domains (e.g., product development and logistics) for analyzing, designing, and describing processes from a strategic point of view. This chapter shows a case study using this modeling approach for an intuitive redesign of S-BPM *process models* based on the rules developed by Lederer et al. (2014a, b) and Lederer and Huber (2014).

2.3.1 Initial Situation

The process owner, responsible for customer support processes in a global company located in Switzerland[3] with an annual turnover of 15 billion Euros, faced the challenge to redesign the implemented process models in one business division in accordance with business objectives. The division this case study looks at has about 200 employees and sells complex tools for energy solutions to business customers. Since some products are highly complex to install, use, and maintain, the company provides extensive customer support via phone and e-mail (e.g., clients can report complaints and warranty issues). The process models for customer support have

[3]For confidentiality, the name of the company is not mentioned and contents of the case study were modified, added or anonymized.

grown since they were designed some years ago. This development has been concurrent with the major problem that the process and its performance measurement no longer follow the strategy of the customer support: Although the vision of the company was to become a leader in innovation, the customer inquiries were processed in such a way that this objective was not achieved systematically. Moreover, the strategic objectives from the top management to the customer support team were to force the sales of additional products and services as well as to ensure a fast issue handling. Due to a high failure rate in the preceding years, the process team was criticized internally. Therefore, the process owner added the objective of increasing the internal reputation in addition to external customer satisfaction.

To foster these objectives, a project team consisting of the process owner, two process team members and an external consultant was established to redesign the process models.

2.3.2 As-Is Analysis

In the case study, the corporate strategy was cascaded in two workshops to the customer support. The project team used different methods (e.g., on-the-job observation and interviews) to design the actual process using several modeling notations including SBDs. Analyzing the current situation, eight fundamental processes could be identified and in all cases neither sufficient performance indicators were documented, nor were strategic objectives explicitly modeled.

The process *warranty first contact* (see left part of Fig. 2.3) as a small part of the process models is well suited to illustrate the optimization. The process starts when the clerk realizes that the customer call refers to a warranty request. The support first checks whether the warranty agreement is still valid. If so, the clerk collects the relevant contract details and determines the internal contact person in the operative department. If a warranty agreement is no longer valid, the customer has the opportunity to book an additional but more expensive warranty agreement to regulate his or her damage. This pre-sales activity is performed by the customer support team and if the client is willing to upgrade his contract, he or she is put through to the sales team.

When analyzing the resulting Strategy Process Matrix of the as-is model (see Fig. 2.3), it became evident that only two of the five given strategic objectives were supported systematically in the process. Moreover, it became obvious that two actions do not serve any strategic target at all. In a detailed analysis it also became evident that the up-selling services of the support team were rarely successful. Since only few indicators were available in the case study, the positive matrix fields in the as-is model are only marked by a color and not by an explanation.

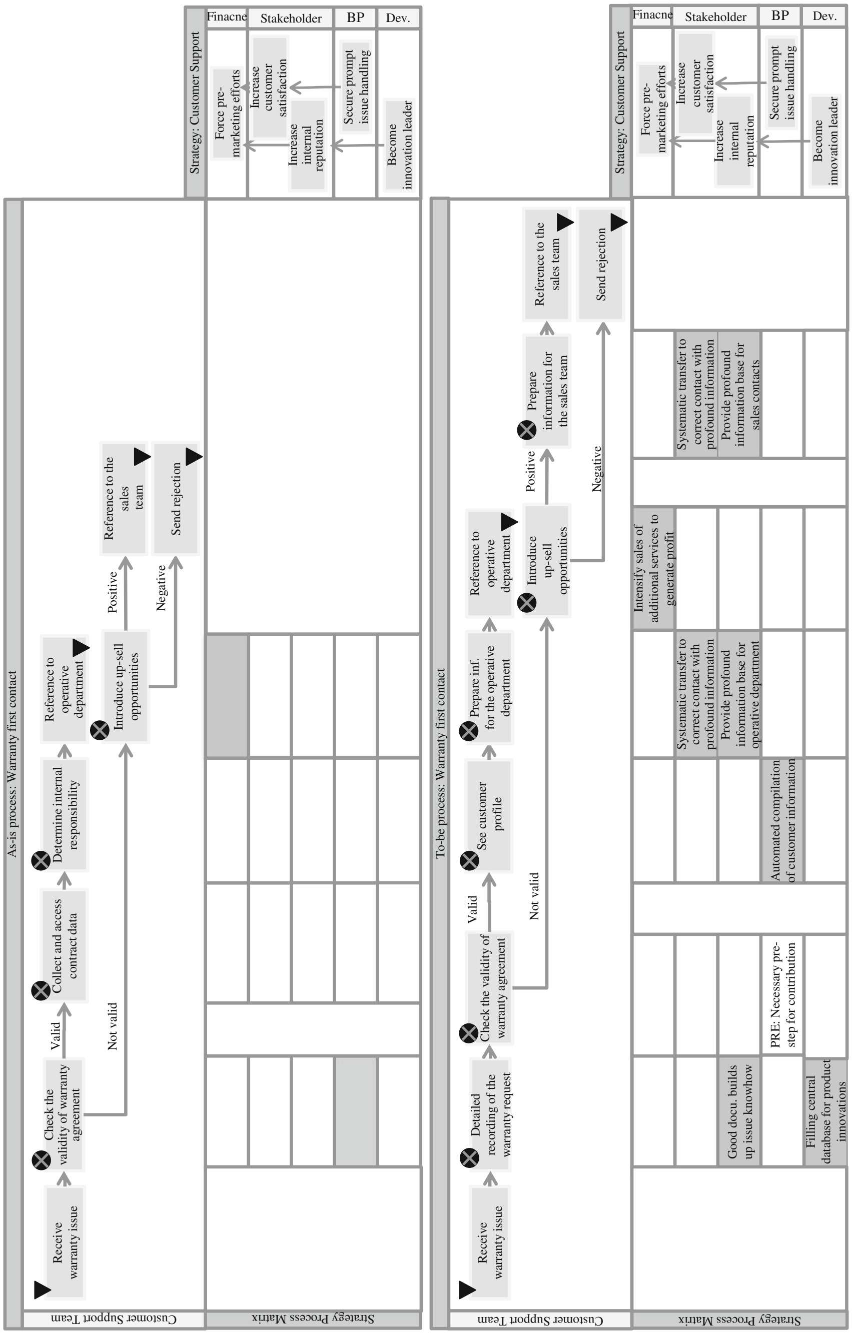

Fig. 2.3 As-is and to-be-modeling of the sample scenario (Petzmann et al. 2007; Quezada et al. 2009)

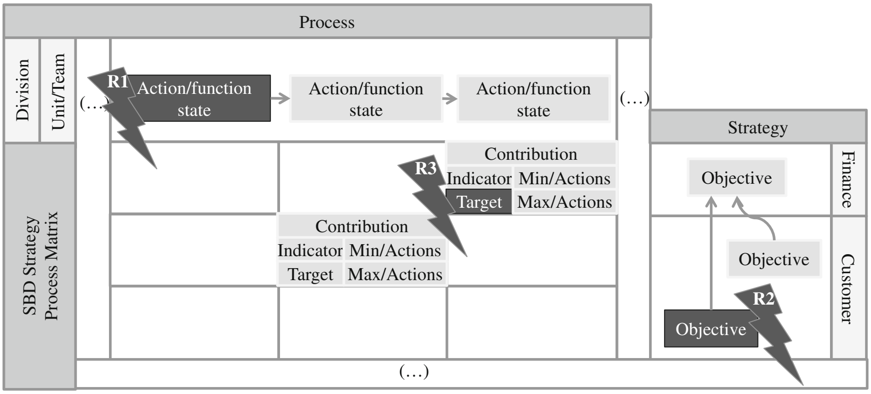

Fig. 2.4 Optimization rules for the subject behavior matrix (Von der Oelsnitz 2009)

2.3.3 Optimization Approach

Realizing these weaknesses, the project team developed three rules for an intuitive process optimization (visualized in Fig. 2.4) to adapt strategy-orientation in SBDs by following the concepts of *connectivity* (explicitly linking performed work to overarching objectives), *simplification* (questioning process models with respect to their relevance for company targets) and performance *measurement* (evaluating workflow performance) (Chen et al. 2009).

R1: "Strive for connectivity"
This rule focuses on the adaption of activities without strategy contribution. The matrix can show function states without any strategic contribution. This is indicated by an empty matrix column. In this case, two corrective actions are possible:

- *Removing state*: First is to look closely at whether the visualized function or action is necessary at all. If the action or function does not help in achieving an objective, the analyst should consider whether the activity binds resources, slows down the process time, or comes with handling costs. That way the analyst may determine whether there is sufficient reason for this activity to remain.
- *Outlining support states*: However, some function states need to be performed due to internal requirements (e.g., data backup steps), dependencies on other processes (e.g., documentation tasks in IT systems) or dependencies on other states in the same process (e.g., automated preliminary data check before interpretation). These linkages should be outlined in the matrix field.

R2: "Strive for simplification"
This rule stands for avoiding objectives which are not operationalized. If the matrix shows rows free of contributions, this can indicate a missing operationalization of

business objectives. However, process managers need to implement states which execute strategies:

- *Complement of activities*: If the operationalization of the strategic objective should be performed by the process, additional states should be added, so that the process also focuses on the achievement of the strategic goal.
- *Project-based implementation*: There are situations where the process to be optimized is not suitable for implementing a strategic objective (e.g., workshops to redesign software interfaces can help to speed up a workflow and can therefore help to achieve faster processes, but such initiatives can usually only be achieved in projects outside of the pure process execution). In these cases the process owner should clarify this fact by documentation in the matrix.

R3: "Strive for measurement"

This rule requests adjustments of matrix fields with a permanent non-achievement of contributions. In contrast to the other rules, this view does not focus on the creation or representation of strategy-orientation but addresses their actual achievement. This problem can be detected if target values in the matrix field cannot be achieved repeatedly. If the documented actions in the matrix fields have not been taken, they have to be executed first. If these actions cannot ensure that the expected indicator values are achieved, the following four corrections for changing the process model are available:

- *Correct arrangement of actions*: First, it should be examined if the defined actions are sufficient, meaning whether they are suitable to influence the performance indicator in a positive manner. Measures with an unclear effect on the indicator (and thus on the strategic objective) should be replaced by more effective actions. Moreover, large actions (e.g., one day staff training) should also be split (e.g., into the individual contents of the training) to better identify the lack of effectiveness of individual components.
- *Correct contents of actions*: Furthermore it is necessary to examine whether the actions to be taken are equipped with too few or the wrong resources. In the case of staff resources, the motivation, the competences, and the time availability need to be analyzed. IT resources (e.g., software tools and interfaces) must be examined focusing on their effectiveness.
- *Correct targets*: Usually the process owner is responsible for the design of the model including the matrix, while the objectives of the Strategy Map are given by his or her superiors or are developed together with him or her. Therefore the documented targets need also to be examined critically. Optimizing this point, the matrix offers an innovative way: From the matrix it is quickly transparent which process activities also contribute to a given objective. Sometimes less expensive, faster, or easier-to-handle actions or functions in the same row can be taken. Thus, the matrix can support a more efficient allocation of resources.

- *Correct indicator*: The indicator should also be checked for typical quality criteria. Thus, the process owner should carefully determine whether the implemented performance indicator is strategy-oriented, meaningful, actionable, and traceable. Inappropriate indicators are to be replaced.

2.3.4 To-Be Modeling

In workshops, the optimization rules have been applied step by step based on the chronological sequence of all processes. In the meetings, two employees of the support team, an external consultant, and the process owner were involved. For each state, the three rules were applied in creative meetings.

First, each status was checked according its contribution to objectives (R1). The contributions were briefly listed and later refined. Process stakeholders were mostly in the position to give a qualitative assessment on whether the objectives have been achieved (R3). Second, R2 was applied at the end of the workshop globally for the whole process.

In the case that workshop participants could not come to an adequate result, the workshop continued with the sequence of the states. Like this, the creative and motivating working atmosphere was preserved.

Critical cases where initially no solution could be found (e.g., process simplification, see R1) or in which the parties had different views (e.g., for actions following R3) were given to special small groups for further meetings. In particular, little Delphi studies turned out to be very effective: Workshop participants developed ideas separated from each other and then compared their results in a further round.

Finally, all results were summarized and cross-checked with all rules in a third step.

The resulting and optimized process can be found in the right part of Fig. 2.3: One major adjustment in the redesigned process is the introduction of a documentation step before the warranty agreement is checked. With this new documentation, the process owner is now in the position to give a detailed report on product deficiencies and desires of the customers and can thus propose ideas for innovative solutions (indicator: share of innovative solutions from the data base that lead to a proof of concept). Ad hoc requests from other internal positions, which often arise in the regulation of damages, can be answered well founded. This leads to a positive image of the customer support team (indicator: agreement rate to the statement that the customer support is a competent partner). A new IT system is able to display all relevant contract data of the customer based on the warranty agreement information. This allows faster subsequent processing. To address the poor figures of up-selling activities, comprehensive measures are planned in the accompanying documents (an excerpt can be found in Table 2.1). Moreover, new preparatory actions before transferring a customer call to other internal departments can support the work of these departments and improve the customer experience.

Table 2.1 Excerpt of the accompanying matrix documentation (Lederer et al. 2015)

Intensify sales of additional services to generate profit		
Performance indicator	I1: Percentage of customer dialogues which lead to contact with the sales team (annual review) I2: Percentage of up-selling offers which result in premium after sales products (quarterly review)	
Target	I1: 17%; Falling down to 15% is acceptable. I2: 5%; Falling down to 4% is acceptable.	
Actions (excerpt)	In case of falling below	▪ Building pair teams for dialogue situations (support team and sales agent at the phone) ▪ Training on the training guide for presenting the value proposition ▪ Fictitious test calls to ensure compliance
Running project-based implementation	▪ Annual workshop to redesign the interview guidelines together with ▪ Weekly work on the whiteboard with the best tips and tricks for sales talk	

2.3.5 Evaluation

The application of the optimization approach increased the strategic focus in all eight process groups. The process owner uses the matrix for monitoring the process activities. The metrics-based management of strategic objectives can be used for communicating to the top management. The process team now understands the adjustments based on the matrix as a communication tool very well and is more motivated to align actions with the underlying objectives. All stakeholders share a very positive evaluation of the approach and its impact both on everyday process execution and new optimization rounds. This is primarily attributed to the understandable, intuitive, and visual approach. The company currently considers applying the approach to other processes as well as initiating further developments such as personal scorecards and integrated incentive systems.

2.4 Case Study on Strategic Monitoring of S-BPM Instances

The previous case study from the customer support has shown how to increase strategy implementation for S-BPM *process models*. This case study transfers the third rule of strategic measurement to single *process instances* (Lederer et al. 2015) in order to realize effective strategy monitoring and measurement.

2.4.1 Initial Situation and Approach

The proposed control system was developed and simulated in the context of the product development process of a multinational manufacturing company headquartered in Germany.[4] The company is in its branch a world-leading producer in a business-to-business value chain. The enterprise employees about 16,000 employees and realizes a turnover of about 2.5 billion euros per year. The company was facing the problem of poor profit, which resulted, among other influences, from inadequate strategic orientation of product development projects. Major reasons for that were identified in

- the missing ability to bring new products into the market in a timely way and before its competitors,
- the tendency to produce what is possible and not what is demanded by the market,
- the missing ability to run through the development process while sticking to the predefined cost goals, and
- the missing ability to develop products that satisfy the quality expectations of potential customers.

As a result, key strategic objectives for the product development process were

- the increase in efficiency in the development process by reducing overhead to bring products into the market more quickly,
- the promotion of customer integration into the development process to increase the market chances of new product development efforts, and
- the improvement of process understanding amongst product developers to enable them to cope with the quality and cost targets.

By pursuing those objectives, the company tried to maximize its market success while developing on a low-cost level and simultaneously promoting the high-quality image of the company. In this context, *middle* (e.g., business division leads) as well as *low management levels* (e.g., project leaders) faced problems justifying their actions in line with business strategy as well as motivating the *process teams* (e.g., technicians, analysts, material specialists) to work in accordance with the tactical and strategic objectives predefined by *higher management levels*. Especially in regions outside of Europe, product development projects had a low degree of compliance and therefore could not be supervised in a systematic and reproducible way on an instance level.

A project team was tasked to design and implement a monitoring system which is able to comprehensively control process instances with respect to corporate strategy. At the same time the system should control the strategic compliance in

[4]For confidentiality, the name of the company is not mentioned and some contents of the case study were modified or anonymized.

Fig. 2.5 Product development stage gate process (Von der Oelsnitz 2009)

product development holistically. The implementation of control indicators and the measurement of strategy achievement using the Strategy Process Matrix instead of only focusing on compliance with the budget should help the *middle managers* to monitor several projects in their range of responsibility and should also help the *lower managers* to monitor single product development instances from a balanced strategic target point of view. Short-term objectives (e.g., preventing production risks, realizing material specifications) on instance levels should be controlled and aligned with long-term business goals (e.g., time to market, turnover, etc.).

Comprehensive BPMN process descriptions (e.g., detailed workflows, procedural instructions and documents) were already available at the beginning of the case study: Fig. 2.5 illustrates the stage gate development process of the company on the highest granularity level. Given the fact that the process steps describe a commonly known and widely spread generic development process, it becomes obvious that the process needs to be modeled in a more detailed form in order to be used on operational and tactical levels. Therefore, each stage was modeled as Strategy Process Matrix using SBDs. The contents of the matrix fields were developed in interdisciplinary workshops conducted by a project team globally interviewing project managers with several years of experience in product development. An external BPM consultant assisted in this effort.

2.4.2 Architecture of the Monitoring System

As outlined, the system to be developed by the project team needed to monitor the strategy achievement for single instances (product development projects) as well as across instances (e.g., all projects in a specific business division). Therefore, beyond the top management, which defines the corporate strategy (Von der Oelnitz 2009), two responsibility levels to control operational as well as tactical objectives were involved in the system:

- *Instance level*: The final implementation of strategy is operationalizing strategy in process instances using *operational objectives*. These objectives are managed by the lower managers (e.g., team leader or project manager). In the detailed form of SBDs for a Strategy Process Matrix on instance level, the matrix does not control and optimize process models but focuses on immediate correction actions for individual process instances (e.g., ad hoc adjustments instead of generic and long-term corrective actions for later process instances).

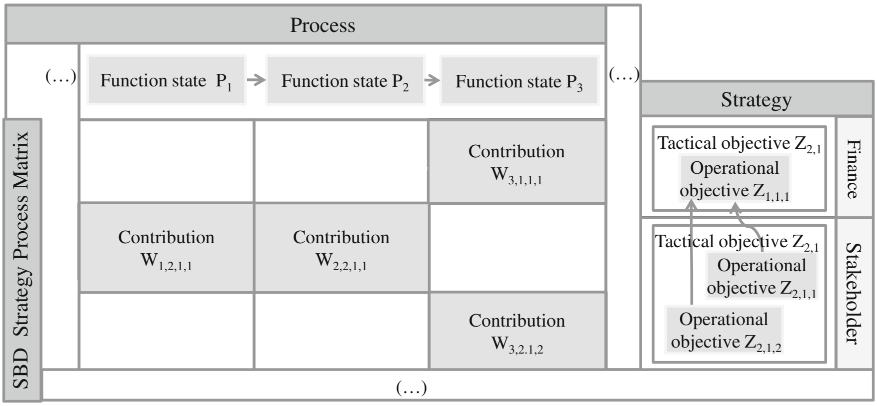

Fig. 2.6 Monitoring system architecture (Von der Oelsnitz 2009)

- *Middle management level*: On the middle management level, the *tactical objective* achievement, meaning mid-term and cross-instance, is controlled by middle managers (e.g., Business Line Directors). This level combines mid-term *tactical objectives* with SBD process models.

The project team came up with the core idea of the control system that is a *horizontal accumulation* of the contributions (e.g., indicators of $w_{1,2,1,1}$ and $w_{2,2,1,1}$) from the matrix for individual function states. By doing so, the overall objective achievement of each objective (e.g., $z_{2,1,1}$) can be calculated (see Fig. 2.6), which was one major target in the scenario. Figure 2.6 outlines that the tactical objectives from the middle level (tactical objectives) are used but may be enriched by additional operational objectives. The operational objective $z_{2,1,2}$ for example is a refinement of the existing objective structure. By a *vertical aggregation* of operational objectives (e.g., $z_{2,1,1}$ and $z_{2,1,2}$) the middle management gets the possibility to control the tactical objective achievement (e.g., $z_{2,1}$).

The matrix shows operational contributions, short-term indicators as well as ad hoc actions which need to be executed if a certain process instance seems not to be able to meet the expectations defined in the model. Since the process model and process descriptions on the middle level set up the specific requirements for all process instances following this model, the operational contributions ($w_{p,lmn}$) and targets (z_{lmn}) documented in the Strategy Map are the same as on the middle level.

Figure 2.7 visualizes the Strategy Process Matrix for the first stage of the stage gate development process for middle managers. Table 2.2 shows a small excerpt of the accompanying documents of the matrix, which were developed in several interviews and in workshops as they were introduced in the first case study.

To make the calculation of the achievement more clear for managers, the range of evaluation values for the indicator fulfillment was chosen between [0,2] according to the assessment suggestion by Benson (2007) (see Table 2.3). This

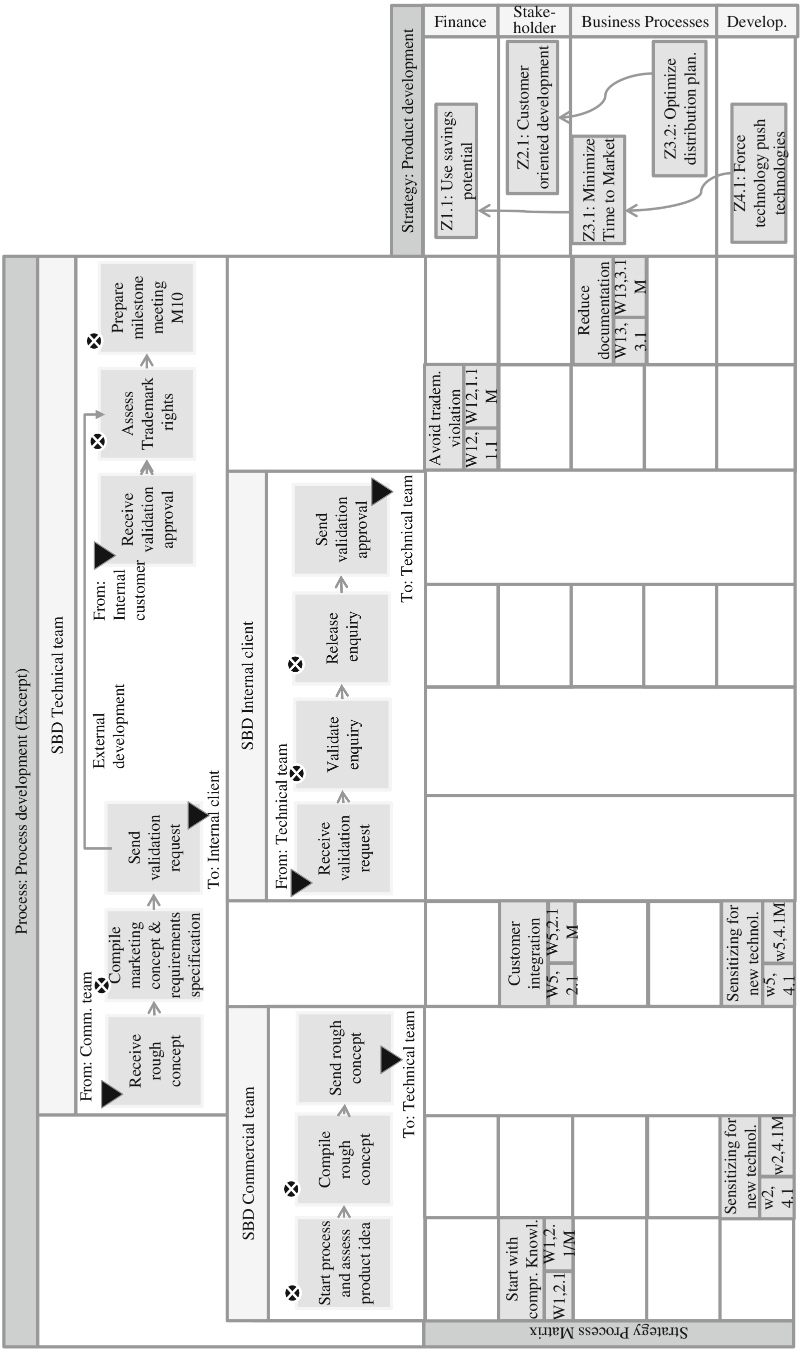

Fig. 2.7 Strategy process matrix using SBDs on middle management level

Table 2.2 Excerpt of the matrix field documentation (Von der Oelsnitz 2009)

Tactical objective	Contribution	Indicator	Actions
$Z_{2.1}$: Customer-oriented development	**$W_{1, 2.1}$:** Start of development only with comprehensive knowledge of customer requirements	**(Status 1, 2.1):** Customer requirements are documented correctly and completely	Integration of lead customers before starting a development, obtaining user experiences with prototypes
	$W_{5, 2.1}$: Involvement of internal and external customers in requirement specifications	**(Event 5, 2.1):** Internal and external customers are integrated in relevant workshops	Sales staff, sales force, marketing specialists and external stakeholders (customers, suppliers) participate in the preparation of the specifications as defined role
$Z_{3.1}$: Minimize time-to-market	**$W_{8, 3.1}$:** Reduction of documentation requirements for milestone 20	**(Event 8, 3.1):** Evaluation workshop to short-list documents regarding their added value	Documents and concepts that are identified in the workshop with no added value will be excluded from the scope of the project documentation
	$W_{10, 3.1}$: Validate the involvement of all customer requirements	**(Indicator 10, 3.1):** Number of additional identification requirements **Target value:** Permitted only in 5% of the current developments	No adoption of the specifications in the milestone panel without checking the customer integration

Table 2.3 Evaluation schema (Von der Oelsnitz 2009)

Evaluation	Indicator		
	Performance indicator (quantitative)	**Event**	**Status**
0	degree of fulfillment <30%	Full occurrence	Missed
1	30%< degree of fulfillment <90%	Occurrence in parts	Partially met
2	90%< degree of fulfillment <100%	No occurrence	Achieved

scale was adequate for the managers concerned because a sufficient variation is possible without too many details.

According to the concept of the company-wide applicable Strategy Process Matrix, the process model on the middle level set up the specific requirements for all process instances following this model. The operational targets (z_{lmn}) and contributions ($w_{p,lmn}$) described in the Strategy Map on the instance level correspond with those on the middle level. The determination of goal achievement for development projects (instance level) can be calculated by the *horizontal accumulation of operational contributions* to realize a monitoring system of the lower managers[5]:

$$\mathrm{z_{lmn}} = \left(\frac{\sum_{p=1}^{P} \mathrm{w_{p,lmn}}}{2\mathrm{a}_{lmn}} \right) * 100 \quad \text{for } l \in [1, L];\ \mathrm{m} \in [1,\ \mathrm{M}];\ \mathrm{n} \in [1, \mathrm{N}]. \tag{2.1}$$

Analogously, the *horizontal aggregation on middle level* can be described as

$$\mathrm{z_{lm}} = \left(\frac{\sum_{p=1}^{P} \mathrm{w_{p,lm}}}{2\mathrm{a}_{lm}} \right) * 100 \quad \text{for } l \in [1, L];\ \mathrm{m} \in [1, \mathrm{M}]. \tag{2.2}$$

The *vertical aggregation* of operational objectives to aggregate operational objective achievements to tactical objective achievement can be realized as follows:

$$\mathrm{z_{lm}} = \frac{\sum_{n=1}^{N} \mathrm{z_{lmn}}}{\mathrm{N}_{lm}} \quad \text{for } l \in [1, L];\ \mathrm{m} \in [1, \mathrm{M}];\ \mathrm{n} \in [1, \mathrm{N}]. \tag{2.3}$$

N_{lm} describes the number of operational objectives per tactical objective.

In order to extend the approach from single process instances and to measure strategy achievement for multiple instances, which is the aim of business division leads responsible for multiple development projects, the mean value is used to control the overall strategy achievement. By vertically calculating the strategy achievement for distinct process instances, the objective attainment on the middle level for tactical presets can be determined:

$$\mathrm{Z_{lmn}} = \frac{\sum_{x=1}^{X} \mathrm{z_{lmn}}}{\mathrm{X}} \quad \text{for } l \in [1, L];\ \mathrm{m} \in [1, \mathrm{M}];\ \mathrm{n} \in [1, \mathrm{N}]. \tag{2.4}$$

X represents the quantity of process instances (e.g., product development projects) and $\mathrm{Z_{lm}}$ signifies the strategy achievement for tactical objectives on the middle level.

2.4.3 Sample Calculation

The monitoring system was developed to overcome the described challenges of the manufacturer to control and increase strategy implementation. The system was simulated for one large business division of the company which included 17 completed as well as running product development instances in the business year

[5]The extended variables are: Operational objective z_{lmn}; Running index n for operational objective; Number of operational contributions a_{lmn} per operational objective z_{lmn} (e.g., z_{111}, z_{124}); Operational contribution $w_{p,lmn}$.

Table 2.4 Simulation data (Von der Oelsnitz 2009)

Level	Contribution	Value	Contribution	Value	Contribution	Value
Middle	$w_{7,1.1}$	1	$w_{8,3.1}$	0	$w_{5,4.1}$	1
	$w_{1,2.1}$	1	$w_{3,4.1}$	0	$w_{10,3.1}$	2
	$w_{5,2.1}$	2				
Instance	$w_{7,1.1.1}$	1	$w_{5,2.1.1}$	2	$w_{4,3.1.2}$	1
	$w_{3,1.1.2}$	1	$w_{8,3.1.1}$	0	$w_{3,4.1.1}$	1
	$w_{1,2.1.1}$	1	$w_{10,3.1.1}$	2	$w_{5,4.1.1}$	0

2013. The calculation should serve to identify in which process steps as well as on which organizational level the strategy cannot be achieved. Table 2.4 shows the achievements that were evaluated using indicators, status and events.

Table 2.5 shows the calculation of objective achievement on middle and instance level based on the values of Table 2.4.

Based on the resulting values of this case, a consistent objective structure could be assumed. This means that the operational and tactical objectives were consistent in the scenario. The degrees of horizontal and vertical goal attainment on both the instance as well as the middle level coincided (e.g., the objective of cost savings [$z_{1.1}$] has been met on the two levels by 50 %).

Based on the results from this case study, the following interpretation could be made by the project team: (1) The estimation of the management that objectives on the instance level were not achieved by the instances could be shown by the calculation. The corrective ad hoc measures for the contributions which were defined in this case study in a matrix for the first time should be taken into account by the project leads to improve states with indicators not fulfilling the set target values. Special efforts should be made to force technology push innovations, since the projects observed are not able to support this objective at all. (2) The middle management objectives are also not achieved. Given the fact that the comparison between the vertical aggregation on the instance level matched the horizontal accumulation results on the middle level, the objective breach eventuated from the

Table 2.5 Calculation example based on the simulation data (Von der Oelsnitz 2009)

<table>
<tr><th colspan="2"></th><th colspan="2">Aggregation and calculation</th></tr>
<tr><th colspan="2"></th><th>Horizontal</th><th>Vertical</th></tr>
<tr><td rowspan="2">Level</td><td>middle</td><td>• $z_{1.1} = (w_{7,\,1.1})/2a_{1.1}*100 = 50\%$
• $z_{1.2} = 50\%$ (given by the available data)
• $z_{2.1} = (w_{1,\,2.1} + w_{5,\,2.1})/2a_{2.1}*100 = 75\%$
• $z_{3.1} = (w_{8,\,3.1} + w_{10,\,3.1})/2a_{3.1}*100 = 50\%$
• $z_{4.1} = (w_{3,\,4.1} + w_{5,\,4.1})/2a_{4.1}*100 = 25\%$</td><td></td></tr>
<tr><td>instance</td><td>• $z_{1.1.1} = (w_{7,\,1.1.1})/2a_{1.1.1}*100 = 50\%$
• $z_{1.1.2} = (w_{3,\,1.1.2})/2a_{1.1.2}*100 = 50\%$
• $z_{2.1.1} = (w_{1,\,2.1.1} + w_{5,\,2.1.1})/2a_{2.1.1}*100 = 75\%$
• $z_{3.1.1} = (w_{8,\,3.1.1} + w_{10,\,3.1.1})/2a_{3.1.1}*100 = 50\%$
• $z_{3.1.2} = (w_{4,\,3.1.2})/2a_{3.1.2}*100 = 50\%$
• $z_{4.1.1} = (w_{3,\,4.1.1} + w_{5,\,4.1.1})/2a_{4.1.1}*100 = 25\%$</td><td>• $z_{1.1} = (z_{1.1.1} + z_{1.1.2})/N_{1.1} = 50\%$
• $z_{1.2} = 50\%$
• $z_{2.1} = (z_{2.1.1})/N_{1.1} = 75\%$
• $z_{3.1} = (z_{3.1.1} + z_{3.1.2})/N_{1.1} = 50\%$
• $z_{4.1} = (z_{4.1.1})/N_{1.1} = 25\%$</td></tr>
</table>

consolidated objective breach on the subjacent instance level. Whereas projects were on a good path to increase customer-oriented developments, the objectives of distribution planning and cost-cutting were only partly implemented in the given projects.

The following corrective actions to optimize the strategic and tactical goal achievement could be taken: (1) implementation or, if necessary, additional definition of ad hoc measures on the instance level, (2) conducting a root cause analysis considering the non-compliance with instance and middle contributions, (3) long-term monitoring and assessment of general measures on the middle level regarding the supportive impact for goal achievement in later process instances, and (4) critical reconsideration of target values for set objectives regarding their achievability in the company-specific organizational context.

2.4.4 Consequences

By developing and implementing the monitoring system, the business division lead is now put into the position to take corrective measures as well as to vindicate additional process resources by assigning them to the given superordinate objectives. An evident advantage of the presented system lies in the identification of possible root causes that are accountable for the non-achievement of strategic and tactical goals. It provides a systematic and reproducible procedure to identify and correct the root of strategic and/or operational drawbacks. Additionally, it allocates all relevant information and support to accomplish process instances in a strategy-oriented way. The indicators and action lists provide a reproducible line of action for how managers in charge can use the approach to show their quantifiable additional value within a company.

However, the proposed monitoring system needs to be assessed in further research by verifying quantitatively measurable improvements for a comprehensive set of case studies. In the case study, a new assessment after one year of implementation can show whether the use of the system, and in particular the implementation of corrective actions, supports the strategy achievement.

Another obstacle that has to be addressed in additional research activities is the fact that the presented approach only focuses on positive contributions that support the achievement of goals. Negative contributions that impede sufficient goal achievement and may be processed in the context of optimization projects need further assessment and consideration.

The described case study concerning the product development process of a multi-national manufacturing company already indicates that the approach tends to become quite complex and hard to comprehend for large process models and calculation schemas. Therefore, an IT-based support for creating and managing the matrix including the aggregations necessary for the control system is crucial for introducing the proposed approach in entrepreneurial practice.

2.5 Summary

S-BPM has a strong and successful foundation in the efficient elicitation and automation of business processes. This contribution brings in a new aspect by demonstrating how to link S-BPM with strategy implementation.

As a matter of fact, the S-BPM's focus on per-subject process models makes it easier to develop reasonably sized Strategy Process Matrices than process modeling notations, which do not possess this instrument of decoupling models of different process participants. Furthermore creating individual Strategy Process Matrices for individual subjects makes it easier to measure, guide, and motivate individuals taking part in the process team to think about their strategy contribution.

Two case studies show that the Strategy-oriented Business Process Modeling approach already has won merits in the business worlds. While the first case study shows how to implement strategies in process models, the second case study demonstrates that strategy implementation can also guide tactical and operational objectives of individual process instances.

From the first case study, practitioners can use the applied rules for their own optimization projects. The rules are very simple to use, yet provide good optimization results. Moreover, the presented working in teams could help in other projects and domains for coming up with creative solutions for increasing the strategy achievement. The second case study could show an approach with which process mangers can read and measure the contribution strategy close to the process. In particular, the horizontal aggregation was intuitively understood by managers. Nevertheless, they result in partly surprising outcomes that have led the company to rethink activities.

Currently, the authors are working to transform the very complex matrices in simple graphs or to equip the approaches with IT support. By doing so, in particular, the applicability of the monitoring system is to be increased, which has been implemented with simple spreadsheet or database systems so far.

References

Benson A (2007) Qualitätssteigerung in komplexen Entwicklungsprojekten durch prozessbegleitende Kennzahlensysteme. Vorgehen zur Herleitung, Einführung und Anwendung. Cuvillier, Göttingen (in German)

Chavan M (2009) The balanced scorecard: a new challenge. J Manage Dev 28:393–406

Chen CC, Jones K (2009) Are employees buying the balanced scorecard? Manage Acc Q 11:36–44

Chen H, Daugherty PJ, Roath AS (2009) Defining and operationalizing supply chain process integration. J Bus Logistics 30:63–84

Glavan LM (2011) Understanding process performance measurement systems. Bus Syst Res 2:1–56

Hörschgen H (2001) Geleitwort. In: Daniel A (ed) Implementierungsmanagement. DUV, Wiesbaden (in German)

Kaplan RS, Norton DP (1996) Linking the balanced scorecard to strategy. Calif Manage Rev 39:53–79

Lederer M, Huber S (2014) Connectivity, simplification, and performance measurement: guidelines for business process strategists in re-engineering projects. IADIS Int J Comput Sci Inf Syst 9:132–145

Lederer M, Huber S, Kocak I (2014a) Increasing strategy-achievement in business processes and information systems using an objective-based optimization approach. In: Nunes MB, Peng GC (eds) Proceedings of the international conference information systems post-implementation and change management 2014 Lisbon, International Association for Development of the Information Society

Lederer M, Kurz M, Lembcke U (2014b) Applying the strategy-oriented business process modeling to S-BPM. In: Zehbold C (ed) Communications in computer and information science (CCIS), S-BPM ONE application studies and work in progress, vol 422. Springer, Berlin

Lederer M, Schott P, Keppler A (2015) Using a strategy-oriented business process modeling notation for a transparent company-wide business control system. Int J Decis Support Syst (forthcoming)

Mair S (2002) A balanced scorecard for a small software group. IEEE Softw 19:21–27

Mintzberg H (1994) The rise and fall of strategic planning. Prentice Hall Europe, Edinburgh

Minonne C, Turner G (2012) Business process management—Are you ready for the future? Knowl Process Manage 19:111–120

Outram C (2014) Making Your Strategy Work. Pearson, Cambridge

Petzmann A, Puncochar M, Kuplich C, Orensanz D (2007) Applying MDA concepts to business process management. In: Fischer L (ed) BPM and workflow handbook: methods, concepts, case studies and standards. Future Strategies, Lighthouse Point

Quezada LE, Cordova FM, Palominos P, Godoy K, Ross J (2009) Method for identifying strategic objectives in strategy maps. Int J Prod Econ 122:492–500

Richardson S (2004) The key elements of balanced scorecard success. Ivey Bus J 69:7–9

Sidorova A, Isik O (2010) Business process research: a cross-disciplinary review. Bus Process Manage J 16:566–597

Von der Oelsnitz D (2009) Management. Geschichte, Aufgaben, Beruf. Beck, München (in German)

Weber J, Schäffer U (2000) Balanced scorecard & controlling: Implementierung-Nutzen für Manager und Controller-Erfahrungen in deutschen Unternehmen. Gabler, Wiesbaden (in German)

Wolf C, Harmon P (2012) The state of business process management. A BPTrends report